

What is claimed is:

1. A laminar sensor for detecting changes on a laminar substrate, the sensor having a resistance at 20°C  $R_T$  and comprising
  - (1) a laminar sheet which (a) has a first surface and a second opposite surface, and (b) comprises a conductive polymer composition which (i) exhibits temperature dependent resistance behavior and (ii) has a switching temperature  $T_s$ ;
  - (2) a plurality of sensing elements (a) each of which comprises an electrode pair, said electrode pair comprising a first electrode and a second electrode, said electrodes being separated from each other and in contact with the laminar sheet, and (b) which are electrically connected in a resistive network, at least some of said sensing elements connected in series; and
  - (3) two electrical leads for connecting the sensing elements into a circuit.
2. A sensor according to claim 1 wherein the first electrode is attached to the first surface and the second electrode is attached to the second surface.
3. A sensor according to claim 1 wherein the first and second electrodes are both attached to the first surface.
4. A sensor according to claim 1 wherein the conductive polymer exhibits PTC behavior.
5. A sensor according to claim 1 wherein the laminar sheet has a thickness of at most 1.0 mm (0.040 inch).
6. A sensor according to claim 1 wherein the conductive polymer composition has a resistivity of at most 10 ohm-cm.
7. A sensor according to claim 1 wherein all of the sensing elements are connected in series.

8. A sensor according to claim 1 wherein when at least one sensing element is exposed to a temperature greater than  $T_s$ , the resistance of the sensor is at least  $1.1R_T$ , at least  $1.3R_T$ .
9. A sensor according to claim 1 wherein the sensor is positioned directly in contact with and covering at least 75% of one surface of the substrate.
10. A sensor according to claim 1 wherein the substrate is a laminar battery element, preferably a lithium ion polymer battery element.
11. A sensor according to claim 1 which detects temperature changes.
12. A sensor according to claim 1 wherein the total surface area of the first electrodes is at least 10% of the total surface area of the first surface and at most 70% of the total surface area of the first surface.
13. A sensor according to claim 1 which comprises an array comprising at least two groups of sensing elements, preferably wherein the groups comprise lines of sensing elements.
14. A lithium ion polymer battery which comprises
  - (A) a laminar battery element surrounded by an insulating material, said battery element comprising (1) first and second battery electrodes, (2) an anode, (3) a separator, (4) a cathode, and (5) an electrolyte; and
  - (B) a laminar temperature sensor positioned in direct contact with the insulating material and covering at least 75% of one laminar surface of the insulating material, said sensor having a resistance at  $20^\circ\text{C}$   $R_T$  and comprising
    - (1) a laminar sheet which (a) has a first surface and a second opposite surface, and (b) comprises a conductive polymer composition which exhibits PTC behavior;
    - (2) a plurality of sensing elements (a) each of which comprises an electrode pair, said electrode pair comprising a first electrode and a second electrode, said electrodes being separated from each other and

in contact with the laminar sheet, and (b) which are electrically connected in a resistive network, at least some of said sensing elements connected in series; and

- (3) two electrical leads for connecting the sensing elements into a circuit.

15. An electrical circuit which comprises

- (A) a laminar sensor for detecting changes on a laminar substrate, the sensor having a resistance at 20°C  $R_T$  and comprising
- (1) a laminar sheet which (a) has a first surface and a second opposite surface, and (b) comprises a conductive polymer composition which (i) exhibits temperature dependent resistance behavior and (ii) has a switching temperature  $T_s$ ;
- (2) a plurality of sensing elements (a) each of which comprises an electrode pair, said electrode pair comprising a first electrode and a second electrode, said electrodes being separated from each other and in contact with the laminar sheet, and (b) which are electrically connected in a resistive network, at least some of said sensing elements connected in series; and
- (3) two electrical leads for connecting the sensing elements into the circuit; and
- (B) sensing equipment electrically connected to the electrical leads to detect a change in the sensor.

16. A circuit according to claim 15 wherein the sensing equipment detects a change in resistance of the sensor.

17. A circuit according to claim 15 which further comprises

- (C) a source of electrical power which is electrically connected to the sensor,

wherein the sensor acts both to detect changes in temperature and as an overcurrent protection device.

18. A circuit according to claim 16 wherein

- (1) the sensor comprises an array comprising at least two groups of sensing elements, and
- (2) the sensing equipment monitors the groups of sensing elements in the array to allow location of a hot spot.